

# Can We Harvest Rainwater for Indoor Use?

Mississippi River Forum  
October 17, 2014

"[A] deliciously fun book. Investigative journalism is rarely as entertaining as it is informative, but Fishman manages both feats. At times episodic in his descriptions of the world's most natural wonder, he is ultimately optimistic." — *The Washington Post*

CHARLES FISHMAN

Bestselling author of *The Wal-Mart Effect*

# *THE BIG THIRST*

The Secret Life and  
Turbulent Future of Water

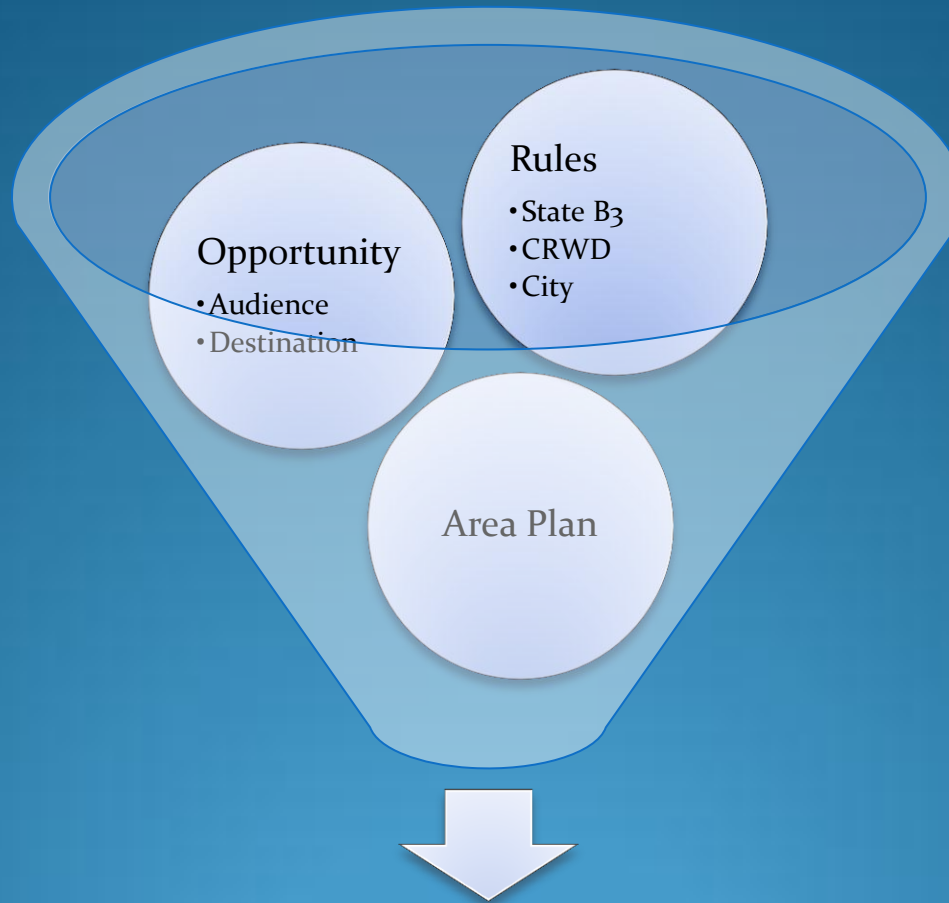
READING GROUP GUIDE INCLUDED







# Local Drivers

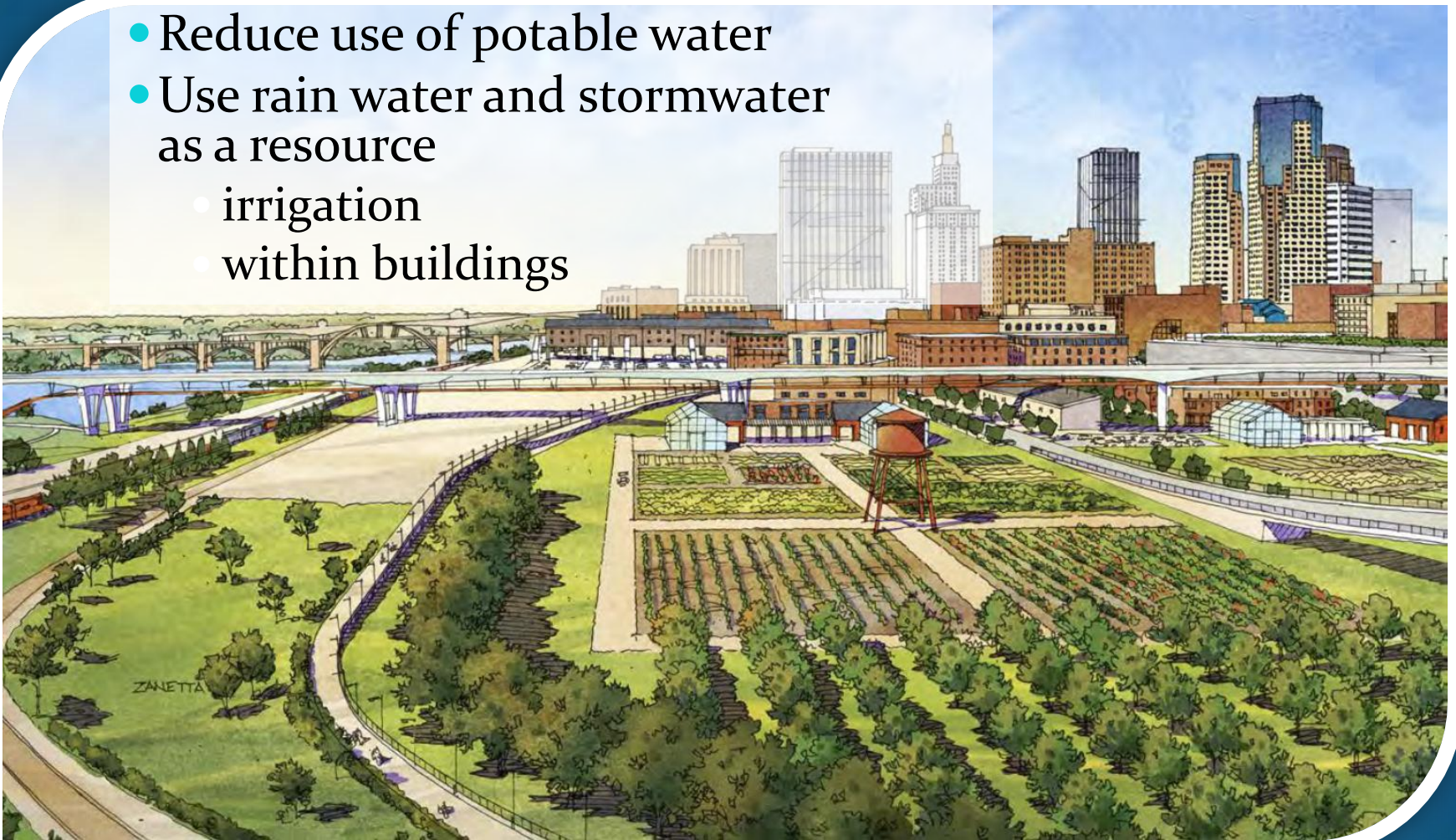


Sustainable Stormwater



# Greater Lowertown Master Plan

- Reduce use of potable water
- Use rain water and stormwater as a resource
  - irrigation
  - within buildings



# State Rules and Agencies

## MN Rule Chapter 4715

- Plumbing Code
- Department of Labor and Industry (DLI)

## MN Rule Chapter 4720

- Public Water Supplies
- Department of Health



# Code Considerations

- Plumbing Code
  - Silent on rainwater harvesting
  - Allows for Alternative Methods review
  - Provisions for First Class cities
- Public Water Supply
  - Treatment
  - Review



# Plan Review - Local

- CHAPTER 4715, PLUMBING CODE
- “The administrative authority shall be the governing body\* ... however, the commissioner of labor and industry retains the ultimate authority”
- “The administrative authority may approve the use of fixtures, appurtenances, materials, and methods of a type not expressly approved, nor expressly prohibited by, this code.”
- “Only potable water shall be accessible to plumbing fixtures supplying water for drinking, bathing, culinary use, or the processing of food, medical, or pharmaceutical products. Only potable water shall be supplied to emergency showers and eyewashes.”

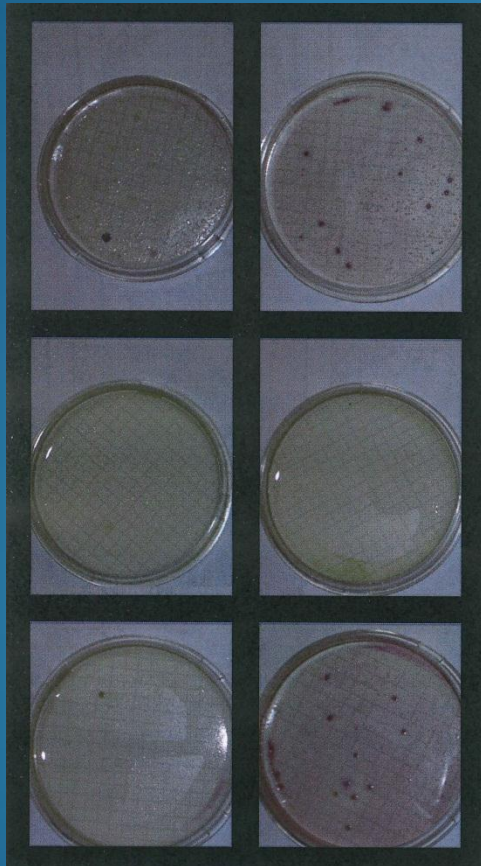
\*MN Rule 1300.0215 subp. 6: DLI governs generally; first class cities exempt.

# Plan Review – Dept of Health

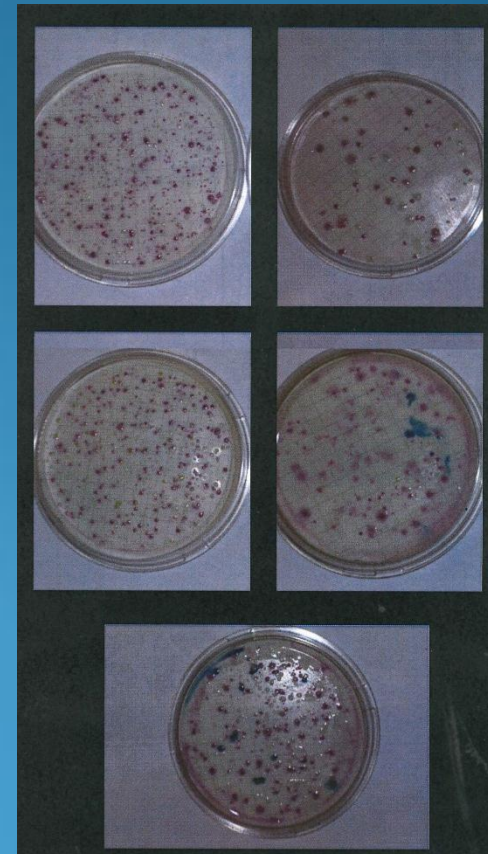
- CHAPTER 4720, PUBLIC WATER SUPPLIES
  - 4720.0010 WATER SUPPLY AND SEWERAGE SYSTEMS.
    - No system of water supply ... for public use or for the use of any considerable number of persons ... shall be installed by any public agency or by any person or corporation ... until complete plans and specifications ... have been submitted in duplicate and approved by the commissioner of health ...

# Treatment Standards?

Rainwater



Stormwater





# Partnership

## Agencies

- Capitol Region WD
- Metropolitan Council
- Metro Transit

## Project Team

- St. Paul Saints
- City of Saint Paul Parks and Rec.
- Ryan Companies
  - Schadegg Mechanical
  - Solution Blue, Inc.
  - Rainwater Management System



# Operation & Maintenance Facility

- 4-acre facility for storing light rail trains
- MCES
  - Proposed re-routing OMF rain leaders
  - Harvest up to 2-acres of OMF rooftop drainage for ballpark



# Design Charrette

- Facilitated by Rainwater Management Services
  - City of Saint Paul
    - Dept of Safety and Insp.
    - Dept of Parks and Rec.
  - CRWD
  - MCES
  - Ryan Cos.
  - Solution Blue
- Schematic design and prelim cost estimates





# Pricing and Options

## LOWERTOWN BALLPARK STORMWATER MANAGEMENT PLAN

### STORMWATER MANAGEMENT FEATURES

1. PLAYING FIELD  
COLLECTION SYSTEM TO HARVEST RAIN FROM PLAYING FIELD ON PRECAST FLUSHED TILES AND REDUCED PLAY CHARGE KEY SITE.

2. FILTRATION AREA  
RETENTION AND TREATMENT OF RUNOFF FROM CONCOURSE AND CONCOURSE TO REDUCE FLOODING AND IMPROVE QUALITY IMPROVEMENTS.

3. RAIN GARDEN W/ STORMWATER PLANTERS  
RETENTION AND TREATMENT OF STORMWATER FROM CONCOURSE BUILDINGS.

4. RED-SOILS  
NO TYPICAL SOIL TYPICAL OF STORMWATER FROM CONCOURSE AREA.

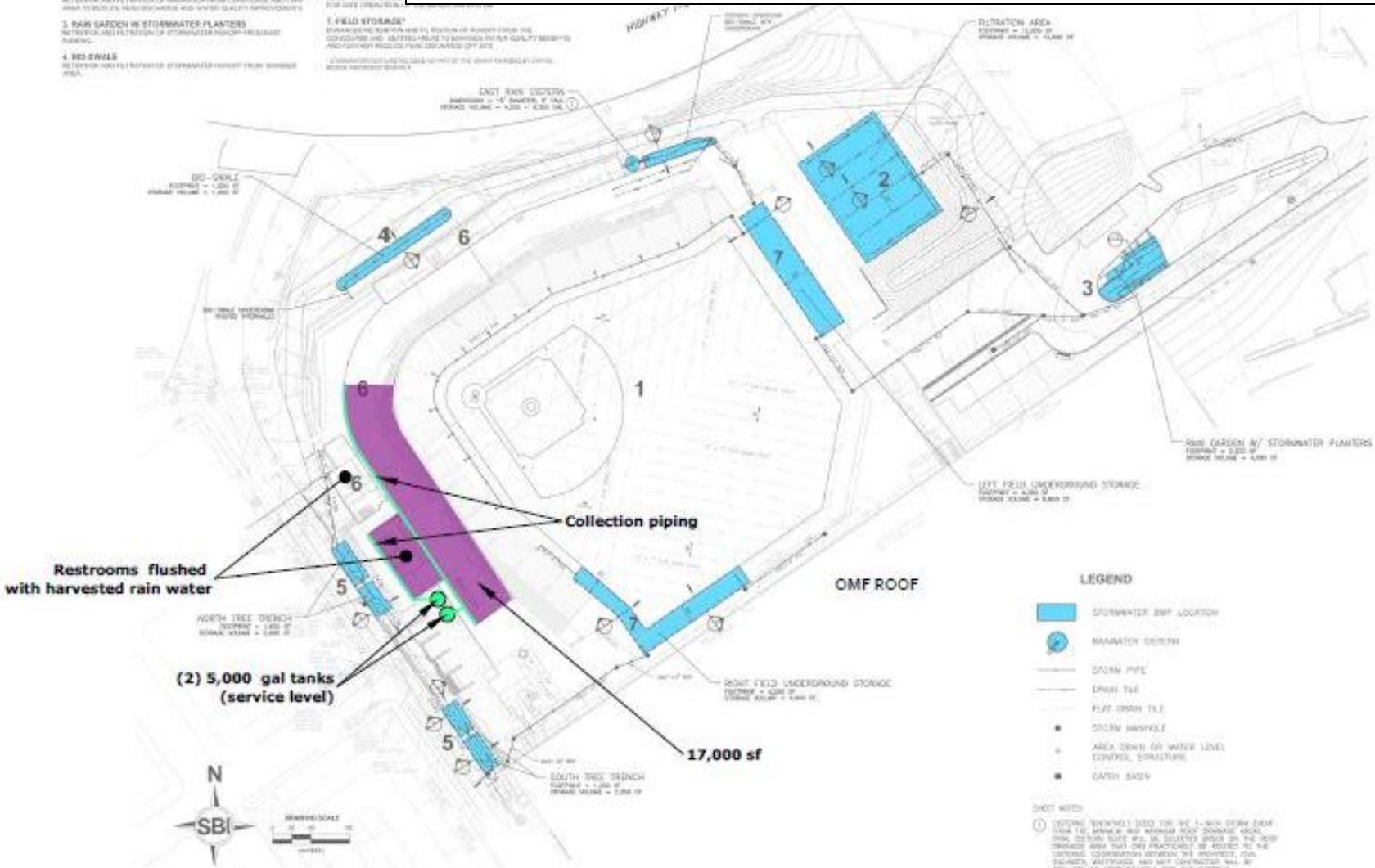
5. TREE TRINCHES  
COLLECTION AND TREATMENT OF RUNOFF FROM CONCOURSE AND CONCOURSE TO REDUCE FLOODING AND IMPROVE QUALITY IMPROVEMENTS.

6. PROGRAM 8 DCP  
COLLECTION OF RUNOFF FROM CONCOURSE AND CONCOURSE TO REDUCE FLOODING AND IMPROVE QUALITY IMPROVEMENTS.

7. FIELD STORAGE  
STORAGE AND TREATMENT OF RUNOFF FROM CONCOURSE AND CONCOURSE TO REDUCE FLOODING AND IMPROVE QUALITY IMPROVEMENTS.

8. STORMWATER TREATMENT  
STORAGE AND TREATMENT OF RUNOFF FROM CONCOURSE AND CONCOURSE TO REDUCE FLOODING AND IMPROVE QUALITY IMPROVEMENTS.

Option A – toilet flushing from ballpark roofs  
25% of toilet fixtures  
\$193,000 investment for 218,000 gallons saved



RYAN AND, INC.  
30 South Street, Suite 200  
Minneapolis, MN 55402-2810  
612.482.4444  
612.482.4444



381 Cedar Street  
Saint Paul, MN 55101  
Office: 612.241.8888  
www.solutionblue.com

PROJECT NAME  
**LOWERTOWN BALLPARK**

LOCATION  
**ST. PAUL, MN**

DATE	DESCRIPTION
1/1/2010	ISSUED FOR PERMIT
1/1/2010	ISSUED FOR PERMIT
1/1/2010	ISSUED FOR PERMIT
1/1/2010	ISSUED FOR PERMIT
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1/1/2010	ISSUED FOR PERMIT

**DRAFT - NOT FOR CONSTRUCTION**

DESIGNED BY  
CHECKED BY  
DATE

DESIGNED BY  
CHECKED BY  
DATE

PROJECT NAME  
**STORMWATER MANAGEMENT PLAN**

PROJECT NO.  
**C550**

# Pricing and Options

## LOWERTOWN BALLPARK STORMWATER MANAGEMENT PLAN

### STORMWATER MANAGEMENT FEATURES

1. PLAYING FIELD  
COLLECTOR AND FILTERATION OF RUNOFF FROM PLAYING FIELD TO REDUCE FLOODING AND IMPROVE PLAYING FIELD QUALITY.

2. FILTERATION AREA  
COLLECTOR AND FILTERATION OF RUNOFF FROM PLAYING FIELD TO REDUCE FLOODING AND IMPROVE PLAYING FIELD QUALITY.

3. PARK GARDEN W/ STORMWATER PLANTERS  
COLLECTOR AND FILTERATION OF RUNOFF FROM PARK GARDEN TO REDUCE FLOODING AND IMPROVE PARK GARDEN QUALITY.

4. BIO-SWALE  
COLLECTOR AND FILTERATION OF RUNOFF FROM PARK GARDEN TO REDUCE FLOODING AND IMPROVE PARK GARDEN QUALITY.

5. TREE TRUNKS  
COLLECTOR AND FILTERATION OF RUNOFF FROM TREE TRUNKS TO REDUCE FLOODING AND IMPROVE TREE TRUNKS QUALITY.

6. PROGRAM 8.00'S  
COLLECTOR AND FILTERATION OF RUNOFF FROM PROGRAM 8.00'S TO REDUCE FLOODING AND IMPROVE PROGRAM 8.00'S QUALITY.

7. FIELD STORAGE  
COLLECTOR AND FILTERATION OF RUNOFF FROM FIELD STORAGE TO REDUCE FLOODING AND IMPROVE FIELD STORAGE QUALITY.

Option B – ballfield irrigation (1/6 OMF roof)  
20% of field demand  
\$360,000 investment for 481,000 gallons saved



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612-481-4800  
www.solutionblue.com

PROJECT NAME:  
LOWERTOWN  
BALLPARK

LOCATION:  
ST. PAUL, MN

DATE	DESCRIPTION
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2/1/11	REVISED FOR PERMIT
3/1/11	REVISED FOR PERMIT
4/1/11	REVISED FOR PERMIT
5/1/11	REVISED FOR PERMIT
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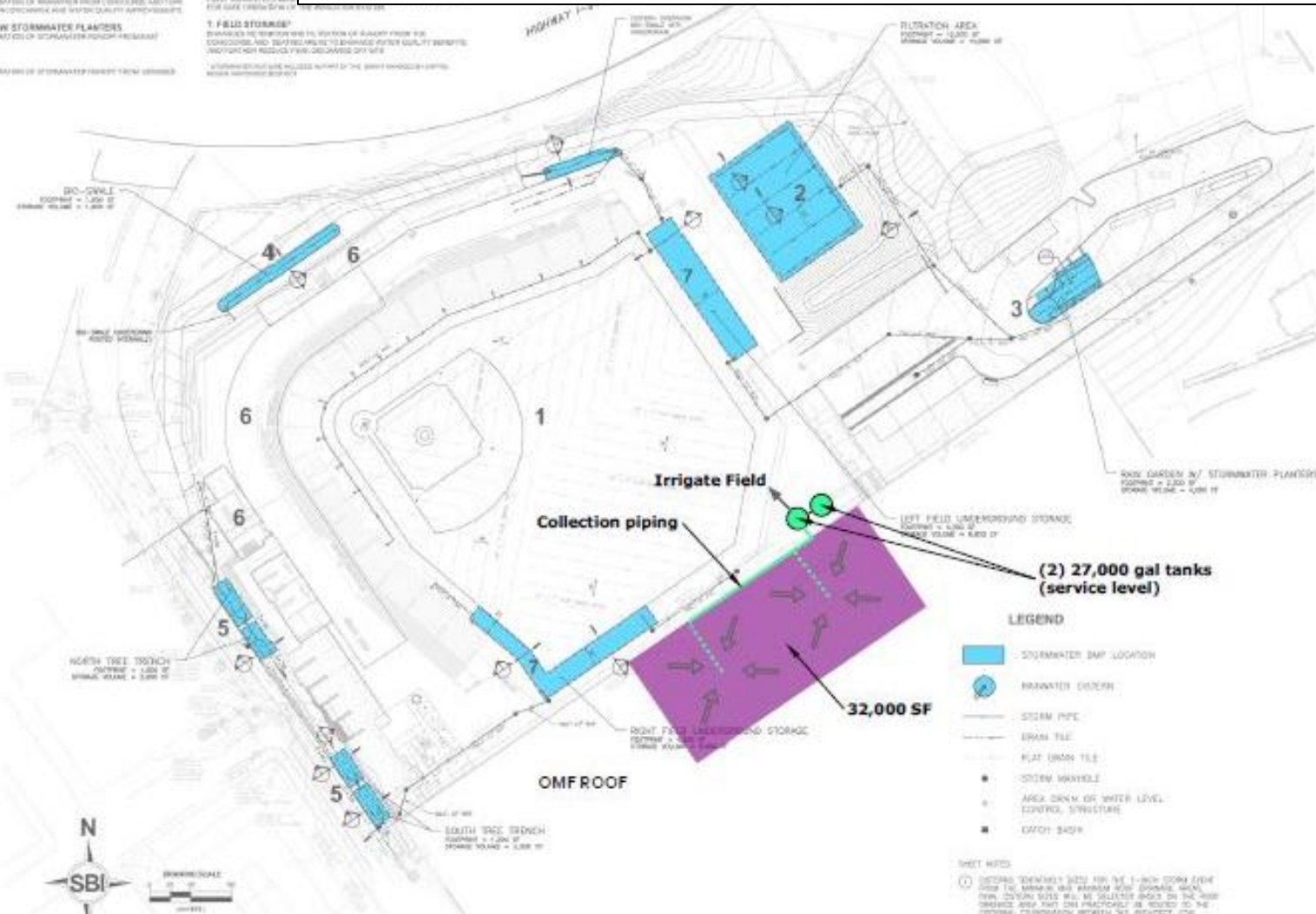
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PROJECT NAME:  
STORMWATER  
MANAGEMENT  
PLAN

PROJECT NO:  
C550



# Pricing and Options

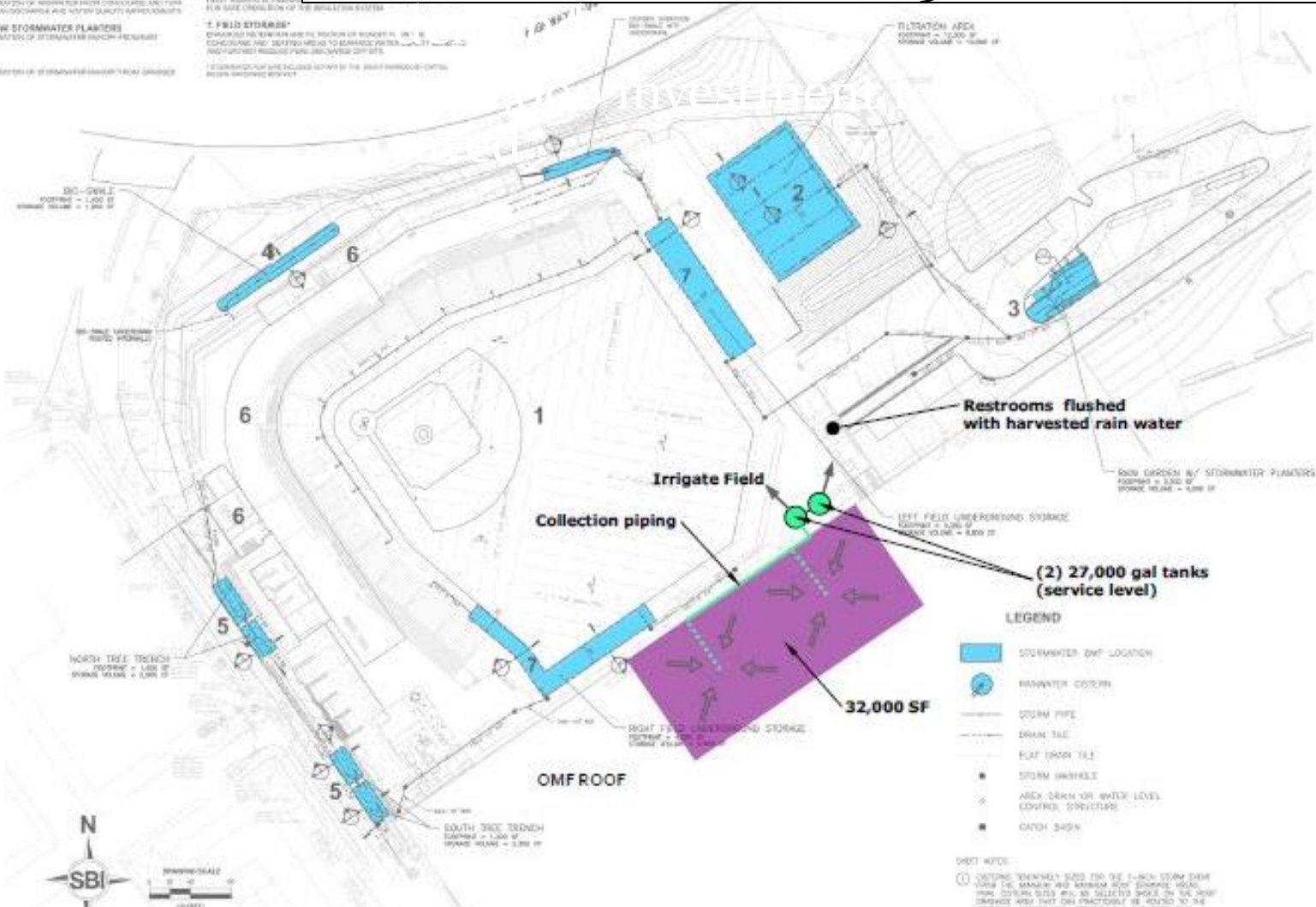
## LOWERTOWN BALLPARK STORMWATER MANAGEMENT PLAN

Option C – toilet flushing & ballfield irrigation  
10% of toilet fixtures; 15-20% of field

### STORMWATER MANAGEMENT FEATURES

- 1. PLAYING FIELD**  
COLLECTION, RETENTION AND DISTRIBUTION OF RAINWATER THAT LANDS ON PLAYING FIELD AND ADJACENT PLAYERS FIELD AND REDUCES PAVING SURFACE OFF SITE
- 2. FILTRATION AREA**  
RETENTION AND INFILTRATION OF RAINWATER FROM PLAYERS FIELD AND FROM AREA TO REDUCE PAVING SURFACE AND FROM SURFACE ADJACENT TO PLAYERS FIELD
- 3. RAIN GARDEN W/ STORMWATER PLANTERS**  
RETENTION AND INFILTRATION OF STORMWATER FROM PLAYERS FIELD AND FROM SURFACE ADJACENT TO PLAYERS FIELD
- 4. RED SWALE**  
RETENTION AND INFILTRATION OF STORMWATER FROM PLAYERS FIELD AND FROM SURFACE ADJACENT TO PLAYERS FIELD

- 5. TREE-TRUNK-TRAP**  
RETENTION AND INFILTRATION OF RAINWATER FROM PLAYERS FIELD AND FROM SURFACE ADJACENT TO PLAYERS FIELD
- 6. PROGRAM 3 DOPPEL**  
COLLECTION OF RAINWATER FROM PLAYERS FIELD AND FROM SURFACE ADJACENT TO PLAYERS FIELD
- 7. FIELD STORAGE**  
COLLECTION OF RAINWATER FROM PLAYERS FIELD AND FROM SURFACE ADJACENT TO PLAYERS FIELD
- 8. STORMWATER PUMP**  
COLLECTION OF RAINWATER FROM PLAYERS FIELD AND FROM SURFACE ADJACENT TO PLAYERS FIELD



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Minneapolis, MN 55409  
www.solutionblue.com

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Location  
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8	01/11/11	ISSUED FOR PERMIT
9	01/11/11	ISSUED FOR PERMIT
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DESIGNED BY  
SOLUTION BLUE

ENGINEER NAME

REGISTERED NO.

DATE

PROJECT NAME

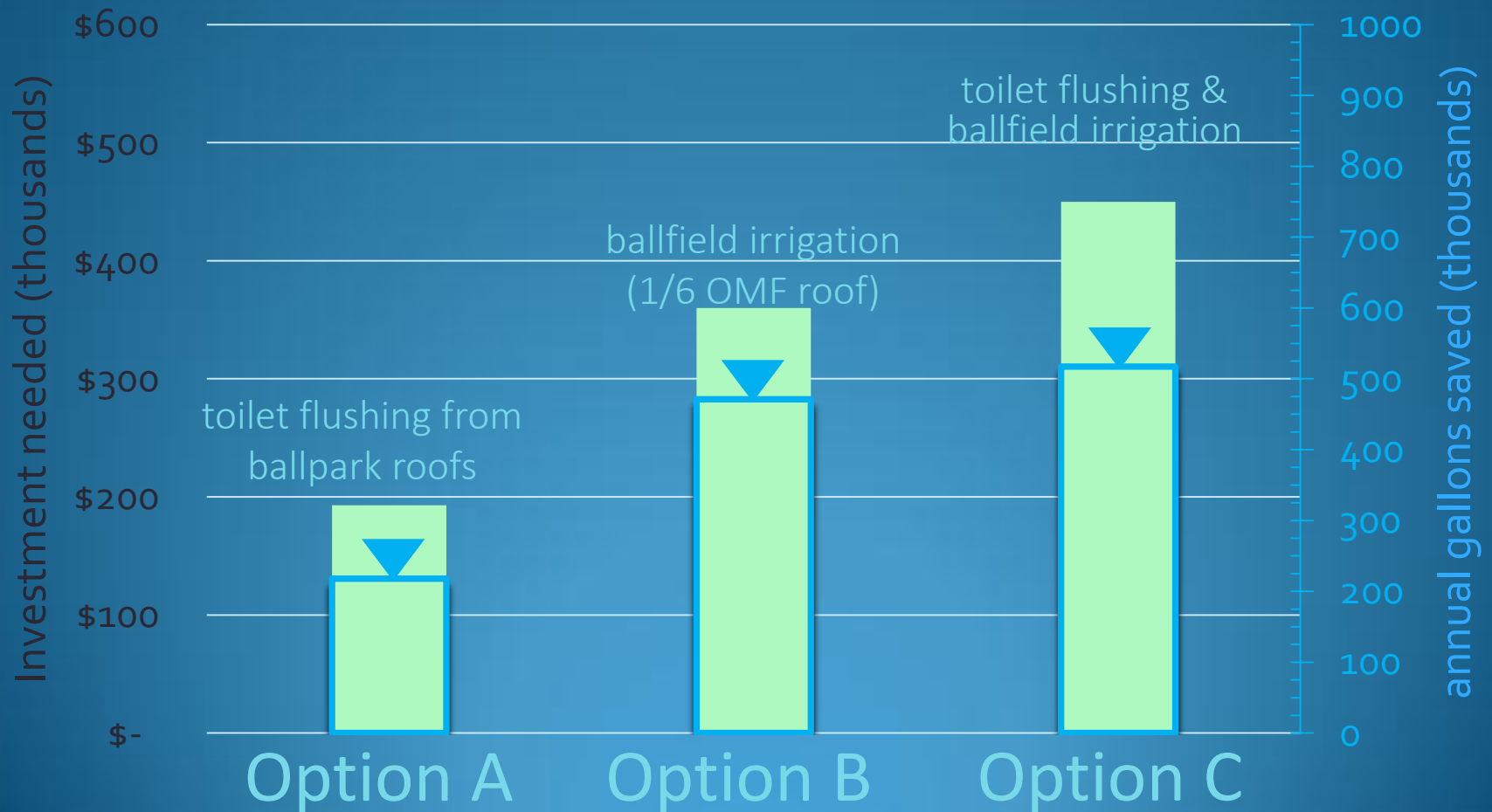
STORMWATER MANAGEMENT PLAN

PROJECT NO.

C550



# Options Analysis



# Preferred Alternative

## Option C

- Responds to Greater Lowertown Master Plan
- Most innovative approach
- Provided contingency for only irrigation (Opt B)

## Option B

- Optimized balance cost and water savings

## Option A

- Most economical alternative, least conservation

# Indoor Use Examples

- Great River Energy (2008)
  - Maple Grove, MN
  - 20,000 gall cistern
  - Platinum LEED-NC (first in MN)
- University of MN (2013)
  - 17<sup>th</sup> Avenue Hall
  - 35,000 gall cistern



*RAINWATER HARVESTING – NOT GREYWATER REUSE*

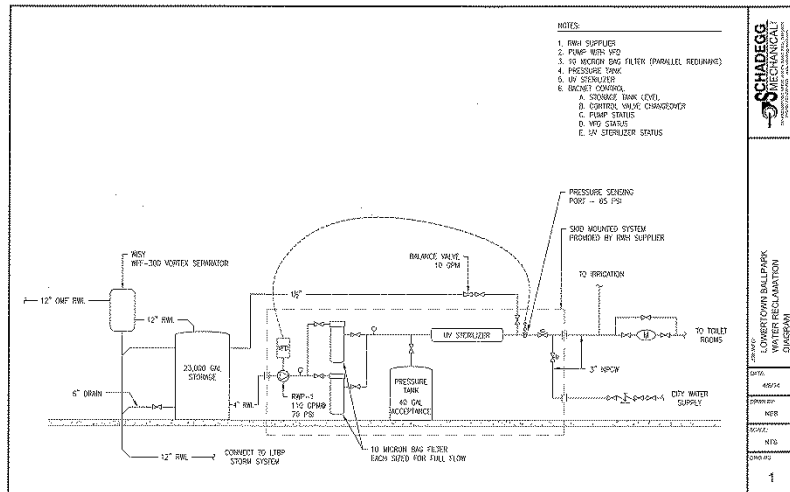


# Design Refinement: U of M tour

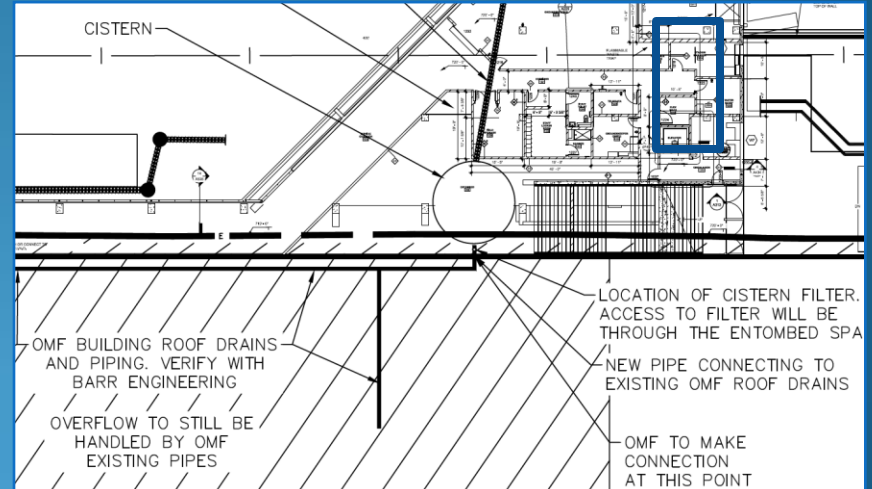


# April 2014 Design Charrette

## System schematic

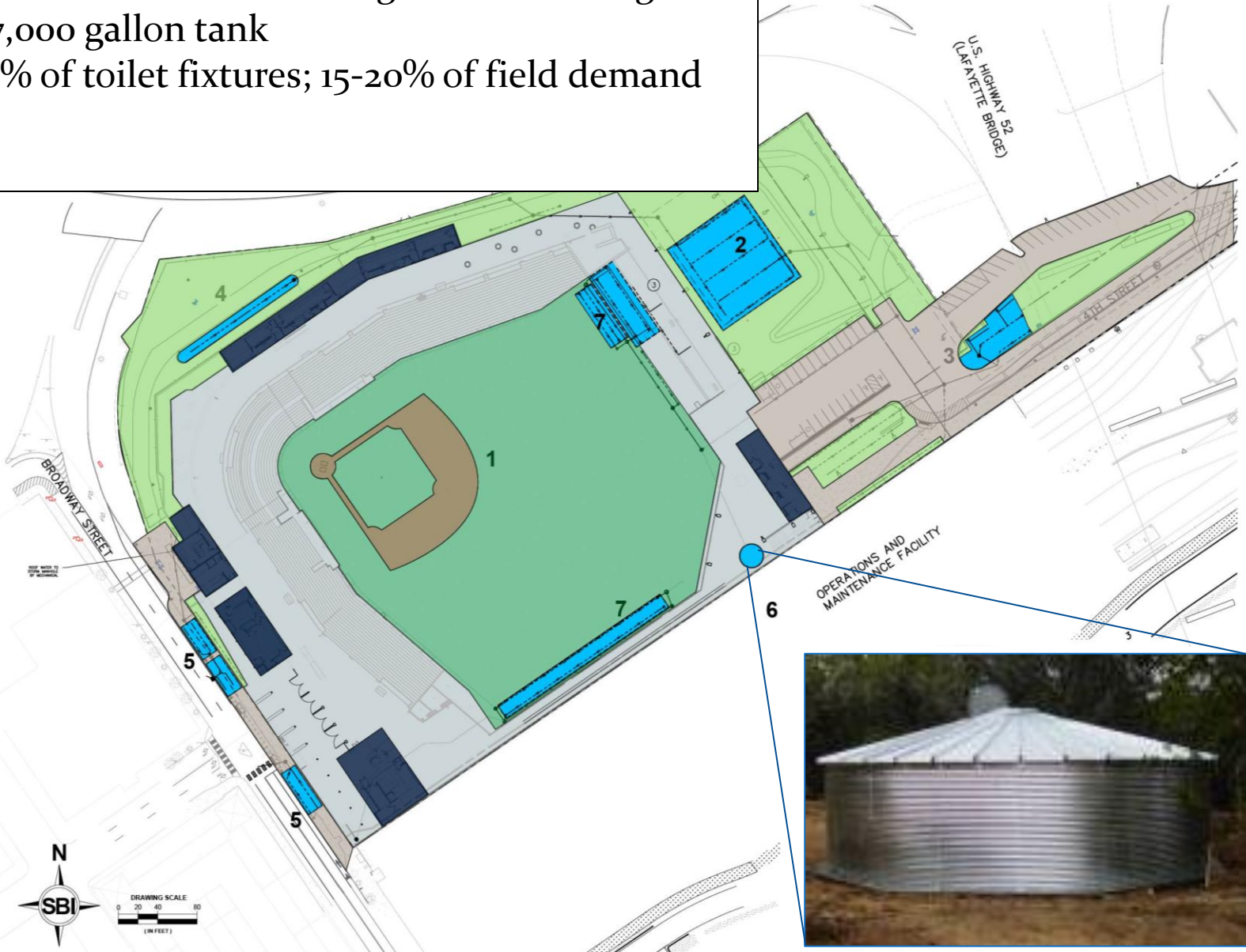


## OMF/Cistern connection



# Final Design

Rainwater use – toilet flushing & ballfield irrigation  
27,000 gallon tank  
10% of toilet fixtures; 15-20% of field demand



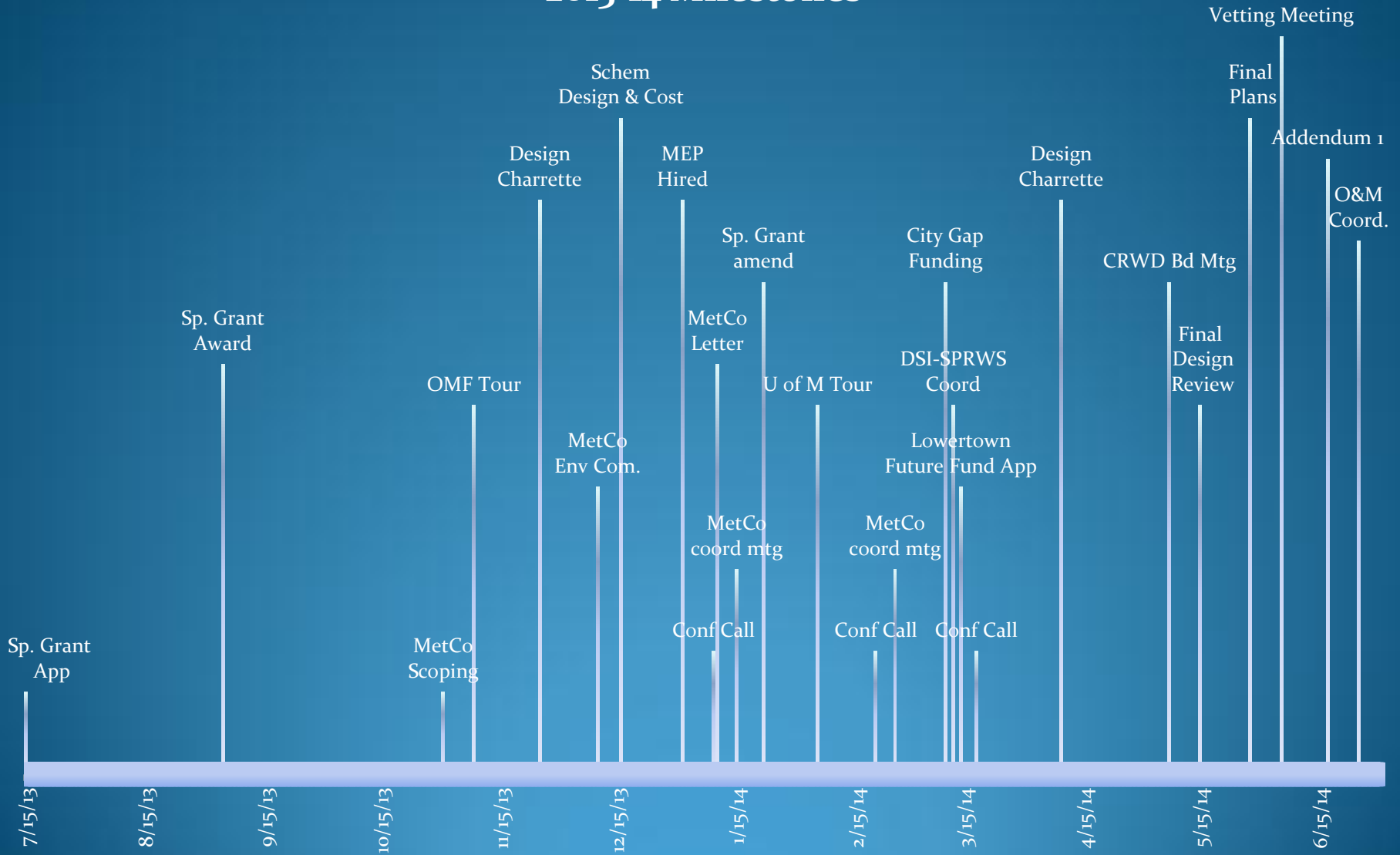


# Vetting and Coordination

- State, local reviewers; funding partners; project team
- Facilitate transparency
- Receive comments, perspective, or technical input



# Lowertown Ballpark Rainwater Harvesting 2013-14 Milestones



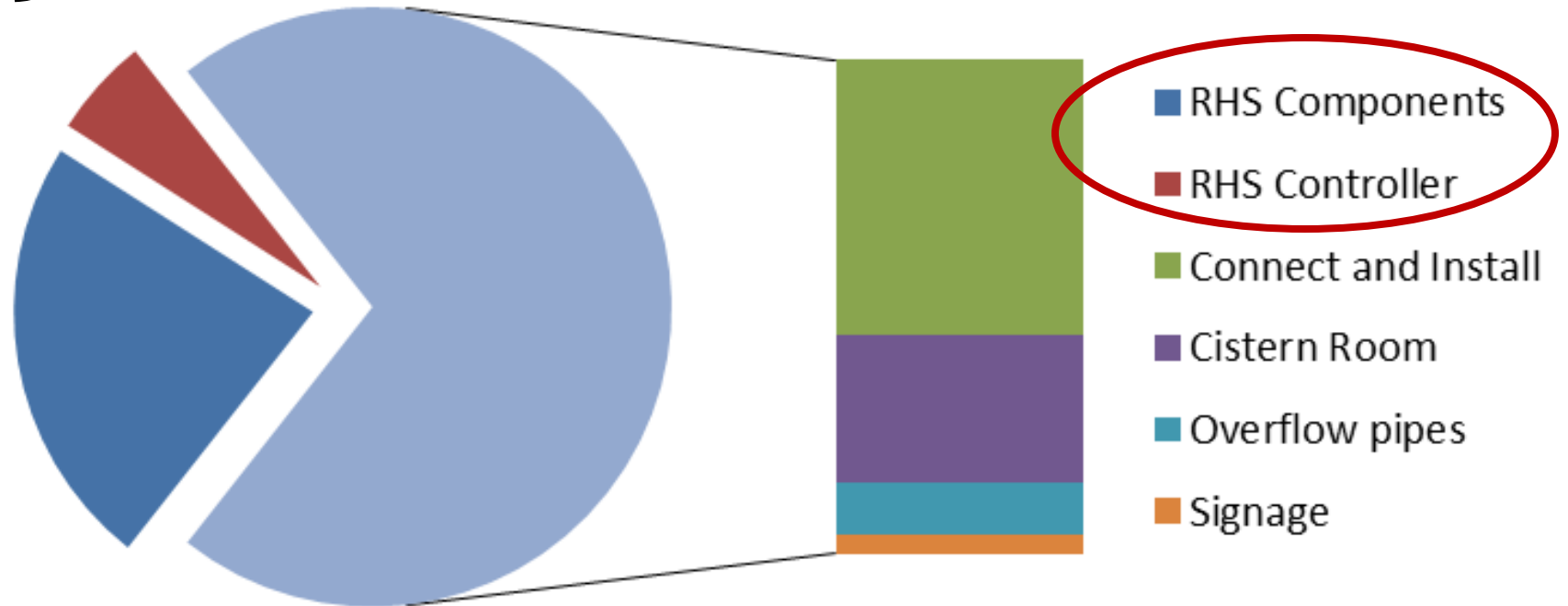
# Enhanced Site Sustainability

- Total cost ..... \$487,000
  - **Rainwater harvesting system** ..... \$ 300,000
  - Enhanced stormwater items ..... \$ 68,000
  - Design and Admin/Fees ..... \$ 75,000
  - Contingency ..... \$ 44,000
- Total grants ..... \$425,000
- Project commitment ..... \$ 62,000

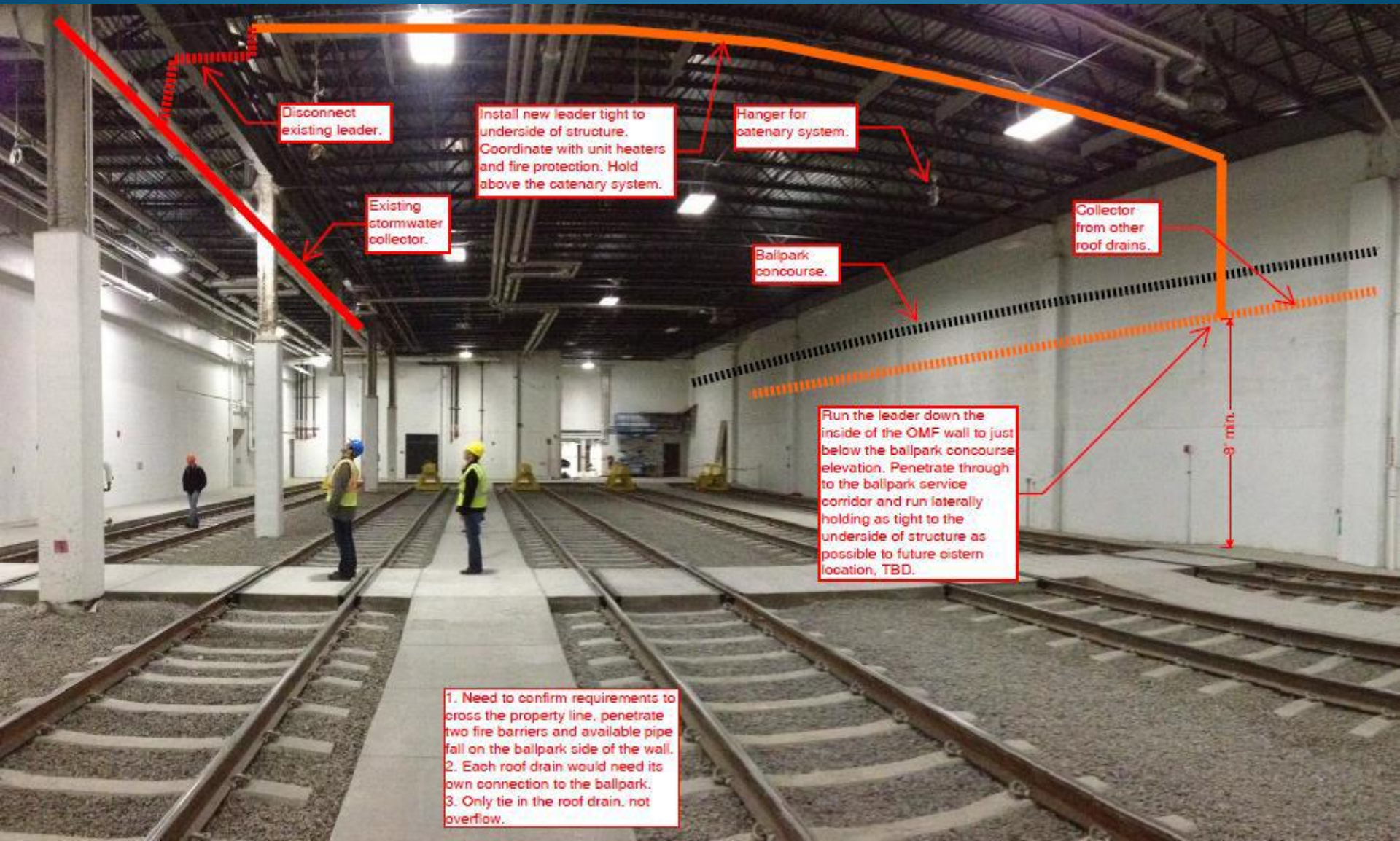


# Rainwater Harvesting System Cost

30%



# Behind the Outfield



# Water Benefits - Annual

- 27,000 gallon tank; 0.75-acre roof area
- 450,000 gallons domestic water saved
- 16% potable water use reduction annually
- Roughly equal to 7 single family residential properties



# Is Indoor Use Allowed?

- Great River Energy - Maple Grove (2008)
- 17<sup>th</sup> Avenue Dormitory - University of MN (2013)
- Lowertown Regional Ballpark (2015)
  - Utilized draft Chapter 17 of UPC
  - Incorporated treatment standards from NSF/ANSI 350

# Code Templates

- Uniform Plumbing Code
  - International Assoc. of Plumbing and Mechanical Officials
  - Rainwater harvesting – UPC Chapter 17 (IAPMO)
  - Graywater reuse – UPC Chapter 16
- International Plumbing Code
  - International Code Council
  - Graywater reuse
- American National Standards Institute (ANSI)
  - Rainwater Catchment Systems Standard (ANSI 63)
    - American Society of Plumbing Engineers
    - American Rainwater Catchment System Association [501(c)3]
- IAPMO Green Plumbing & Mechanical Supplement (2012)

# Code Revisions

- Water Reuse Interagency Workgroup
  - MDH, MPCA, DNR, Met Council; DLI/Plumbing Board
- Recommendation to DLI Plumbing Board
  - UPC Chapter 17 – consider with amendments
    - Lowest risk of the alternate sources
    - Present the least jurisdictional overlap
  - UPC Chapter 16 (gray water) – negative
    - Higher risk
    - Several jurisdictional conflicts related to gray water and wastewater applications.





# Mississippi River Forum

## October 17, 2014